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ABSTRACT

This module, concerned with fractional parts, contains 15 activity sheets, 12 of these involve students in making fractional parts and discovering the relationships of less than, equal to, and greater than, between different fractional parts. The last three sheets are for extending and enriching experiences with fractional parts. Teaching suggestions are provided for each activity sheet. (MK)

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ELEMENTARY MODULE FOR USE

IN A

MATHEMATICS LABORATORY SETTING

FRACTIONAL PARTS

by

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Fractional Parts

This module may be used in a variety of ways.

1. Individually, if the child can read well enough.
2. In small groups, with student leader or teacher leader.
3. In pairs or trios.
4. It may be used as a total group project if allowance is made for some children to go much slower and work maybe several days with concepts on one sheet. Conversely, more able students should work as rapidly as comprehension takes place.

Materials

.Contained in this module:

1. 15 activity sheets
2. Fraction parts

.Teacher must provide:

1. Colored construction paper
2. Scissors
3. Magic markers
4. Protractors, compasses or round lids
5. Straightedges
6. Heavy envelopes

OBJECTIVES

.Given fractional parts, the student will put together pieces that are less than one, equal to one and greater than one.

.Given specific fractional parts such as 2/4, the student will find equivalent fractional parts.

OVERVIEW

.There are twelve activity sheets that involve students in making fractional parts and discovering the relationships of less than, equal to and greater than, between different fractional parts.

.Three sheets, #13, 14, and 15, for extending and enriching the experiences with fractional parts are included.

.Activities 1 through 11 provide the physical experience of making the parts and fitting them together with increasing challenge. Hopefully they highly motivate <u>individual</u> discovery on a level commensurate with each child's ability rather than a prescribed curriculum level.

.Activity 12 provides a worksheet for checking progress.

.Activities 13, 14, and 15 should provide individual experience as far as a child can go on his own, with limited guidance.

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I. Activity Sheet #1

A. Materials needed:

1. Heavy colored construction paper
2. Scissors
3. Either compasses, round protractors, or round lids sturdy enough to draw around their edges.

B. Work to be completed by the student:

1. Five sets of circles, each set a different color, drawn and cut by the student as carefully as possible.

   Be sure that whatever tool the child chooses to use for his circles, all his circles are cut the same size.

C. Teaching suggestions:

1. Allow students to work in pairs, small groups or entire class.

2. Be sure to allow students to make their own circles. The value of "making your own" cannot be stressed strongly enough; if for no other reason than to increase hand/eye coordination.

   As the fractional parts are made, increasing value lies in actually cutting $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{6}$, etc.

   "I do, and I understand!"

II. Activity Sheets #2 and 3

A. Materials needed:

1. Circles from Sheet #1
2. Magic markers for marking halves, thirds, fourths, sixths, etc.

3. Scissors for cutting parts
4. Straightedge for marking off thirds, etc.

B. Work to be completed by student:

1. Set of halves
2. Set of fourths
3. Set of thirds
4. Set of sixths.

C. Teaching suggestions:

1. Be sure the children use one color for all circles used for "1", a second color for all the halves, etc.

2. Watch for, and help children be accurate in making the parts; i.e., careful folding and cutting to make halves and fourths.

3. Ask for ways to make the parts, such as "how can we make halves? fourths? and especially thirds." Most children see the analogy to a clock and will say marks at 12, 4, and 8 o'clock will make thirds. And, of course, sixths are half of thirds, so folding works here again.

III. Activity Sheet #4

A. Materials needed:

1. Sturdy envelope, like heavy manila mailing envelope, as a place for the children to keep their parts.
2. Construction paper
3. Scissors
4. Straightedge
5. Magic markers

B. Work to be completed by the student:

1. Finish all parts for use with later sheets.

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C. Teaching suggestions:

1. Use only if children can think of a way on their own - like using the protractor - or minute marks on the clock (every 12 minutes for fifths). Eighths are easy - halves of fourths. But try to get this to come from the children. If they don't initiate it, it's not likely to "stick".

   Omit this sheet if the children are not challenged sufficiently to work it out themselves.

IV. Activity Sheet #5

A. Materials needed:

No additional materials are needed.

B. Work to be completed by the student:

1. Either written sheet of comparisons of parts; i.e.,

$$\frac{1}{2}>\frac{1}{4};\quad \frac{1}{3}>\frac{1}{4};\quad \frac{1}{2}>\frac{1}{3};\quad \frac{1}{3}<\frac{1}{2};\quad \text{etc.}$$

or lots of oral practice (and checking with parts) in pairs, small groups, or with teacher.

C. Teaching suggestions:

1. Let more able children use the activity sheet themselves with no further directions, and see what happens. Be ready to step in with help or a leading question like "Put 1/4 on top of 1/2 (or some other part) and see which is greater, or smaller".

2. With less secure children, sit down with a small group and work through the sheet with them. Allow more able students to read and interpret for themselves.

3. Encourage the children to work with each other and ask each other in a game-like situation, "Is 1/3 greater than or less than 1/4?, etc. Check for correctness with the parts."

4. Encourage, but do not insist, yet, on the children writing down what they discover. Some need lots and lots of physical experience before being asked to "commit themselves" on paper.

5. Encourage the "good guess" first, then check. Be ready with the question, "Why did you think so?" or "What made you think that might be true?", etc.

   Listen carefully to their explanations and logic. It could prove useful.

D. Variations to the lesson:

1. Suggest that very hesitant children might like to paste down parts on paper with the appropriate "greater than" or "less than" wording or symbol between.

   This approach means, however, that the child will have to make more parts for use with later sheets. It is a way of recording that works for some very, very shy, unsure children.

   The time involved in doing just that (making more parts, as well as pasting

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and comparing) is often worth it in the total long-run pay-off. Kids remember!

V. Activity Sheet #6

A. Materials needed:

No further materials are needed.

B. Work to be completed by the student:

1. Sheet of their own made-up fractions; i.e.,

$$\frac{1}{21} > \frac{1}{45} \; ; \; \frac{1}{15} < \frac{1}{12}$$

C. Teaching suggestions:

1. Try this sheet without their parts in front of them first. If it doesn't work, let them look at, handle, compare what they have made orally with you or a student leader.

2. Try for the "pattern approach", going from:

halves to
thirds
fourths
sixths,
etc.

What you want them to see, of course, is the larger the denominator numeral, the smaller the fractional part is.

"Would you rather share that chocolate cake with just four people?(fourths) or with 25 people?(twenty-fifths)" often helps to make it quite clear.

3. Encourage them strongly to write some of their own as a gauge for yourself on how to proceed.

VI. Activity Sheet #7

A. Materials needed:

1. Large sheets of paper for recording.
2. Perhaps magic markers should be used for writing instead of pencils. Color is often inspirational for children.

B. Work to be completed by the student:

1. Record sheet of what two parts fit together to make less than 1.

C. Teaching suggestions:

1. This card begins comparison of two parts which make less than 1. (Only situation which may produce 1 is $\frac{1}{2} + \frac{1}{2}$.) Be ready for it, agree with it and suggest trying other parts.
2. Be sure to have the children write down what they find out from this card, and encourage as many as you can to work with a friend and to look for more.
3. The very capable child will most likely be able to think up lots and lots that work for "less than 1".

VII. Activity Sheets #8, 9 and 10

A. Materials needed:

No further materials are needed.

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B. Work to be completed by the student:

1. Sheet of "what works" for greater than 1.

C. Teaching suggestions:

1. Work in small groups with children who are working at about the same level.

2. Do some short oral work with groups, then turn them loose to work on their own, recording what they discover.

3. Activity #8 deals with three parts, totaling less than 1. Activity #9 uses as many parts as you wish, totaling less than 1. Activity #10 deals with parts totaling more than 1.

   Essentially, the same teaching techniques can be applied - suggest, watch, be aware of what children are saying to one another and CAPITALIZE ON THEIR DISCOVERIES.

4. For the "more than 1" activity, the check with parts is, of course, an overlap. Mostly, the children see that for themselves; if they don't, try one yourself and let it happen. Then discuss it.

VIII. Activity Sheet #11

A. Materials needed:

   No additional materials beyond large paper for recording.

B. Work to be completed by the student:

1. Record sheet of what parts fit together to make exactly 1.

C. Teaching suggestions:

1. This activity aims at the simple but powerful and important concept of $\frac{2}{2} = 1$, $\frac{3}{3} = 1$, $\frac{4}{4} = 1$, etc., which really escapes many children.

2. Also important are combinations like $\frac{1}{2} + \frac{1}{4} + \frac{1}{4} = 1$, $\frac{1}{3} + \frac{1}{6} + \frac{1}{6} + \frac{1}{3} = 1$, all of which is subtly getting at the concept of fractional equivalency.

3. Be careful here of children fitting together their parts in a sloppy fashion, which looks right, but isn't. For instance:

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{4} + \frac{1}{6} = 1$$

but $\frac{1}{3} + \frac{1}{4} + \frac{1}{4} + \frac{1}{5} \neq 1$ but looks like it might, visually or carelessly done.

4. Lightly work on word "estimating". It's a good one and worth knowing.

IX. Activity Sheet #12

A. Materials needed:

1. Dittoed sheet for each child, or you may work from chalkboard.

B. Work to be completed by the student:

1. Worksheet, or sheet of his own that he has copied from the master, or the chalkboard.

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C. Teaching suggestions:

1. This is a checksheet for the work on Activity #12. Either ditto it off for each child, or let them copy off the problems themselves.

2. Use it as each child is ready for it, or if the unit has been done with the group as a whole, use it at one time.

3. Play down the idea of "test" -- it scares most children, whether or not it shows!

4. Problems missed can help you decide where each child needs more work.

X. Enrichment Sheets #1, 2 and 3

A. Materials needed:

1. Only large paper on which students can record their work.

B. Work to be completed by the student:

1. Record of what he can say about any two or more parts; i.e.,

$$\frac{1}{2} + \frac{2}{3} + \frac{1}{6} > 1$$

$$\frac{1}{2} + \frac{2}{3} + \frac{1}{6} < 2 \ .$$

C. Teaching suggestions:

1. These are extra enrichment sheets to be used with children who can readily extend on their own in many directions.

2. Enrichment #1 challenges their ability to think up and record fractions which are less than, equal to, or greater than the one they chose.

   While the chart makes a neat way to record, the children may come up with a more interesting or totally original way of their own. Let them use it!

3. Enrichment #2 is working with the concepts of what makes exactly 2, and what parts can be put together to make more than 1 but less than 2.

4. Be aware on Enrichment #2 that the overlays of more than 1, plus the parts placed on the second circle, may add up to more than 2. Suggest, if this happens, that the child make "exactly 1" first, then move on to Circle 2 for the extra parts.

5. Enrichment #3 is total open-endedness for the child to work with putting any parts together to see if he can write a true statement about them.

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Activity Sheet #5

$\frac{1}{2}$ greater than $\frac{1}{4}$

$\frac{1}{3}$ less than $\frac{1}{2}$

$\frac{1}{3}$ greater than (>) $\frac{1}{4}$

$\frac{1}{2} > \frac{1}{3}$

$\frac{1}{6} < \frac{1}{4}$

$\frac{1}{4} < \frac{1}{2}$

Activity Sheet #6

$\frac{1}{7} > \frac{1}{8}$

$\frac{1}{15} > \frac{1}{25}$

$\frac{1}{10} > \frac{1}{100}$

Activity Sheet #7

All are less than ($<$) one.

Student Worksheet #12

$\frac{1}{2} + \frac{1}{4} < 1$ $\quad \frac{1}{3} + \frac{1}{4} + \frac{1}{2} > 1$ $\quad \frac{1}{2} + \frac{1}{6} + \frac{1}{3} = 1$

$\frac{2}{3} + \frac{1}{4} < 1$ $\quad \frac{5}{6} + \frac{1}{2} > 1$ $\quad \frac{3}{4} + \frac{1}{3} > 1$

$\frac{2}{6} \quad \frac{2}{3} = 1$ $\quad \frac{3}{4} + \frac{2}{3} > 1$ $\quad \frac{2}{6} + \frac{1}{4} < 1$

$\frac{1}{4} + \frac{1}{3} + \frac{1}{6} + \frac{1}{2} > 1$ $\quad \frac{2}{4} + \frac{2}{3} + \frac{2}{6} + \frac{2}{2} > 1$

Enrichment #3

$\frac{1}{3} + \frac{1}{6} + \frac{1}{5} + \frac{1}{4} + \frac{1}{2} > 1$

Choose five sheets of different colored construction paper and draw some circles, the same size, on each sheet.

Cut them out carefully!

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Keep one set of circles for 1. If you wish, you may mark a large 1 on them with a colored magic marker.

Choose another set of a different color and make halves on them. (For each new set, choose a different color.)

Make a set of fourths. Be sure you cut carefully each time!

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Can you think of a good way to make thirds? and sixths? If you can, share your ideas with others. If you can't, ask a friend for help.

Mark your thirds and sixths if it helps you.

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If you can think of a good way to make fifths or eighths, or any other parts, do so. Be sure to cut carefully each time, and mark the parts if you wish.

Get a large envelope to keep the parts in, so you won't lose them.

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Try these! Make a good guess first, then check with your parts to see if you were right. You may write them down on another piece of paper, if you wish.

Is: $\frac{1}{2}$ greater than or less than $\frac{1}{4}$

$\frac{1}{3}$ greater than or less than $\frac{1}{2}$

$\frac{1}{3}$ greater than (>) or less than (<) $\frac{1}{4}$

$\frac{1}{2} > \frac{1}{3}$

$\frac{1}{6} < \frac{1}{4}$

$\frac{1}{4} < \frac{1}{2}$

Try some with a friend and see if you can guess correctly each time.

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If you look carefully at the parts you have made, and think about some that you haven't yet made, what would you guess might make these statements true?

$\frac{1}{7} \gtrless \frac{1}{8}$

$\frac{1}{15} \ ? \ \frac{1}{25}$

$\frac{1}{10} \ ? \ \frac{1}{100}$

If you are brave, make up some of your own and write them down.

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Try fitting different parts together. Start with just two parts. Are the two parts together less than 1? Guess at these, then check with your parts:

$\frac{1}{3} + \frac{1}{2}$ $\frac{1}{6} + \frac{1}{2}$ $\frac{1}{6} + \frac{1}{3}$ $\frac{1}{6} + \frac{1}{4}$

$\frac{1}{4} + \frac{1}{3}$ $\frac{1}{2} + \frac{1}{4}$ $\frac{1}{3} + \frac{1}{6}$

Make up lots of your own and write them down.

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Try putting three parts together and make them less than 1.

How many different ways can you do it? Write them all down.

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Use as many parts as you like together, but keep the total less than 1.

Write down everything that works.

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Put three parts together to make more than 1. Are there lots of ways to do it?

Try putting parts together to make more than 1. What is the fewest number of parts you can find to make more than 1?

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How many parts can you put together to make exactly 1? See how many ways you can find to make 1, and be sure to write each one down.

Did you guess first, then check? (What you are doing is estimating: that means making a good guess!)

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Try the attached worksheet without using your parts first. Then check each one with your parts and see if you were right.

If you were pretty accurate (that means, right), go on to the next card. If it was pretty hard for you, keep fitting parts together and writing down what you find out until you get pretty good at it.

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Write <1 , >1 , or $=1$ after each group of added fractions.

Example: $\frac{1}{3} + \frac{1}{2} < 1$

$\frac{1}{2} + \frac{1}{4}$ $\quad$ $\frac{1}{3} + \frac{1}{4} + \frac{1}{2}$ $\quad$ $\frac{1}{2} + \frac{1}{6} + \frac{1}{3}$

$\frac{2}{3} + \frac{1}{4}$ $\quad$ $\frac{5}{6} + \frac{1}{2}$ $\quad$ $\frac{3}{4} + \frac{1}{3}$

$\frac{2}{6} + \frac{2}{3}$ $\quad$ $\frac{3}{4} + \frac{2}{3}$ $\quad$ $\frac{2}{6} + \frac{1}{4}$

$\frac{1}{4} + \frac{1}{3} + \frac{1}{6} + \frac{1}{2}$ $\quad$ $\frac{2}{4} + \frac{2}{3} + \frac{2}{6} + \frac{2}{2}$

Fill in the boxes to make true statements.

$\frac{\square}{2} = 1$ $\quad$ $\frac{\square}{2} > 1$ $\quad$ $\frac{\square}{2} < 1$

$\frac{\square}{3} < 1$ $\quad$ $\frac{\square}{3} = 1$ $\quad$ $\frac{\square}{3} > 1$

$\frac{\square}{4} < 1$ $\quad$ $\frac{\square}{4} = 1$ $\quad$ $\frac{\square}{4} > 1$

Can you write three statements that are true for sixths?

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Take your choice of any fraction part you have made. Now fit two or more parts together which are <u>less</u> than your fractions, <u>equal</u> to your fractions, or <u>greater</u> than your fractions.

You may want to make a chart which looks like this:

My fraction part is

<	=	>

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Try putting parts together which equal two whole circles. What works? Be sure to write them down.

Also try putting parts together so that you have more than 1, but less than 2. Don't forget to write them down!

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Enrichment #3

Put together any parts you wish and see if you can write down a true statement about them. For instance, if you put together $\frac{1}{3} + \frac{1}{6} + \frac{1}{5} + \frac{1}{4} + \frac{1}{2}$, would that be

$< \frac{1}{2}$;

< 1 ;

> 1 ;

$> 1\frac{1}{2}$?

Try it and see.

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